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# The Implications of Low-Carbon Trajectories in South Africa

Tara Caetano and James Thurlow

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## About this brief

This brief outlines a number of findings and policy recommendations for the introduction of a carbon tax and the transition to a low-carbon economy in South Africa. The National Treasury proposed the partial implementation of a carbon tax in 2015, along with a number of tax exemptions for energy-intensive sectors. Tara Caetano and James Thurlow used a Computable General Equilibrium model to simulate the proposed carbon tax in order to gain some insight into two important research questions: First to see what the potential impact of the proposed carbon tax would be and, more interestingly, how much the exemptions decrease the effectiveness of the tax; second, to look at the social implication of introducing a carbon tax and how the use of different recycling mechanisms affects these implications. The brief has been designed to introduce South Africa's climate change debate with regard to the proposed carbon tax and outline some of the synergies and trade-offs for emissions reduction and development.

## Policy Brief: The Implications of Low-Carbon Trajectories in South Africa

South Africa is one of the top twenty emitters, by tonnage of CO<sub>2</sub>, in the world and voluntarily committed to an emissions reduction of 34 per cent by 2020 and 42 per cent by 2025 relative to a 'business-as-usual' baseline. With an economy built around energy intensive sectors coupled with urgent development concerns it is important to find win-win scenarios for de-carbonization and development, or rather the *green* and *social*.

The National Treasury proposed the partial implementation of a carbon tax in 2015 set to rise linearly to R120 per ton of CO<sub>2</sub> by 2019.<sup>1</sup> A number of complex exemptions were included in the carbon tax design in order to protect local industry and competitiveness.

There are a few existing studies that use economy-wide models to simulate a carbon tax in South Africa - Pauw (2007), Devarajan et al. (2011) and Alton et al. (2012). All three papers use Computable General Equilibrium models to analyze the impact of a carbon tax in the South African context. They very loosely hint at a carbon tax being an efficient mechanism for emissions reduction and Alton et al. went further to suggest that a tax of R12 per ton of CO<sub>2</sub> imposed in 2012 rising linearly to R210 per ton of CO<sub>2</sub> in 2022 was sufficient for South Africa to meet its national emissions target.

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1 The carbon tax has recently been tabled to allow for more research to be done on the tax design and implications.

Two main elements remain unclear: firstly, from the literature we know that the proposed carbon tax level is too low, but how much do the exemptions reduce the effectiveness of the carbon tax and in turn what is the trade-off between growth and emissions reduction when these exemptions are included; secondly, what are the social implications of implementing a carbon tax and are there possible synergies between reducing emissions and increasing development through the implementation of a carbon tax. We built on the analysis conducted in Alton et al. (2012) by using a similar dynamic recursive CGE model with a more detailed energy sector and an updated labour market to answer these two research questions and provide policy recommendations from our findings.

There were a number of key findings. First, the implementation of a carbon tax is likely to have less of a 'devastating' impact than was previously thought. Higher energy prices might incentivize the development of 'cleaner' sectors such as the biomass industry and boost service sectors. The addition of a carbon tax proves quite effective in terms of lowering total emissions, however as we expected, the tax level (even without the exemptions) is still too low and will not be enough to get emissions down to the target trajectory. Modeling the effective carbon tax after exemptions of around R12 to R48 per ton of CO<sub>2</sub> results in substantially lower emissions reductions without that much of an impact on growth. From this finding, the argument that an increased tax level will cripple the economy seems unjustified and South Africa should capitalize on the growth of sectors that could become more profitable with the introduction of a carbon tax. The table below illustrates the reduction in the effectiveness of the carbon tax when the exemptions are introduced.

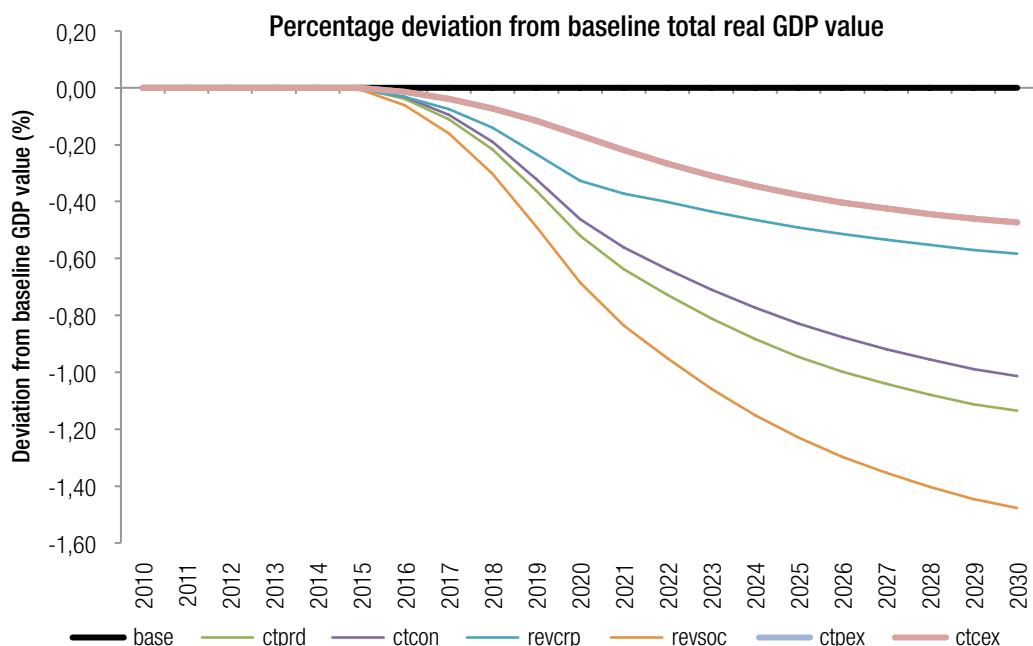
**Table 1. Emissions reduction against the baseline for all scenarios\***

Target	Ratio to baseline emissions						
	Year	Carbon Tax (production)	Carbon Tax (consumption)	Corporate Tax Reduction	Increased Social Grants	Exemptions (production)	Exemptions (consumption)
	2010	0%	0%	0%	0%	0%	0%
-34%	2020	-22%	-23%	-23%	-23%	-9%	-9%
-42%	2025	-32%	-33%	-33%	-33%	-18%	-18%
	2030	-38%	-39%	-39%	-39%	-25%	-25%

\* The first two scenarios present a carbon tax simulated on the production and consumption of the carbon. The next two scenarios are the revenue recycling options of an equal reduction in corporate taxes compared to and equal increase in social grants. The final two scenarios are where we simulated the exemptions for carbon taxed at the point of production and for when it is consumed.

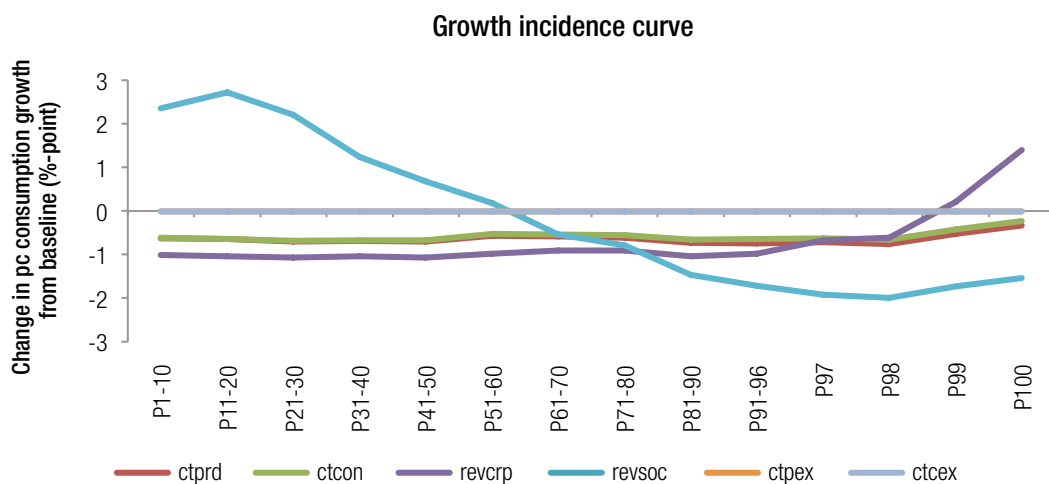
It is clear that the introduction of a carbon tax does not get us to an emissions reduction of 34% by 2020 and 42% by 2025. The effectiveness of the tax decreases substantially when the exemptions are introduced, attaining a reduction of only 18% against the baseline in 2025, almost half of that in the case where there are no exemptions.

The next topic of interest is the potential effects of the tax and the introduction of exemptions on GDP. The main arguments put forward by the National Treasury for the exemptions was the preservation of industry and to reduce the pressure on economic growth in South Africa. Our findings suggest that the exemptions do decrease the negative impact on GDP, halving the deviation from 1% less than the base to 0,5% at the end of the period. The graph below illustrates the impact of each scenario on real GDP (reflected as a deviation from the base scenario).

**Graph 1. Impact on real GDP\***

\* The base case is calibrated according the national electricity build plan and national growth targets. *ctprd* and *ctcon* are the carbon tax scenarios where the tax is levied first on production and then on consumption. *revcrp* and *revsoc* are the two tax recycling scenarios where corporate tax and social grants are adjusted, respectively. *ctpex* and *ctcex* are the two scenarios where we include the exemptions in the case where taxes are levied on production and consumption.

Another finding that is worth noting is that the choice of revenue mechanism has, as one would expect, a substantial impact on GDP. Coupling the tax with a reduction in corporate tax puts less pressure on firms and we see less of a dampening effect on GDP with a decrease of 0,6% against the base. Allowing an increase in social grants has more of a negative impact on GDP. Although, as we can see below in graph 2, social grants may lead to a decrease in GDP but also a narrowing of the income gap with growth in income for poorer households. If we look at these two graphs the trade-off between growth and welfare becomes clearer.

**Graph 2. Scenario Impacts on the Growth Incidence Curve**



To sum up, the introduction of a carbon tax is an effective mechanism for emissions reduction in the South African context. The proposed tax level is too low and the exemptions drastically decrease the effectiveness of the tax on reducing emissions. The introduction of a full, level tax is unlikely to have a 'devastating' impact on the economy and therefore the argument for protecting industry should be reconsidered. In the same light, potential gains from a movement to a low carbon economy should be seriously considered.

The choice of recycling mechanism is critical to ensure we allow for synergies between the *green* and *social* as there is a clear trade-off between growth and welfare.